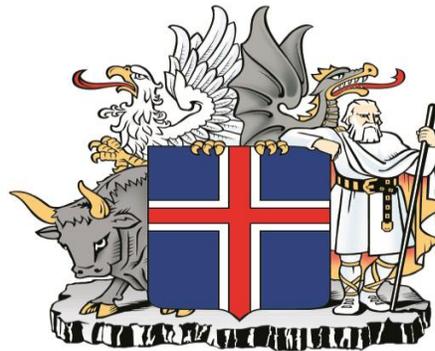


# Regular Monitoring

**And other occurrences at the IRSA laboratories.**



**GEISLAVARNIR RÍKISINS**  
ICELANDIC RADIATION SAFETY AUTHORITY

# Equipment & Software

- Two stationary Ortec HPGe detectors
- ~50% relative efficiencies
- One mobile Ortec HPGe detector
- 18% relative efficiency
- GammaVision
- Greina
- SMath



# Samples

## ■ Regular samples

- Lamb
- Milk & milk powder
- Sea water
- Rain water
- Fish
- Sea weed
- Other meats

## ■ Other samples

- Whale
- Salt
- Polar bear
- Soil

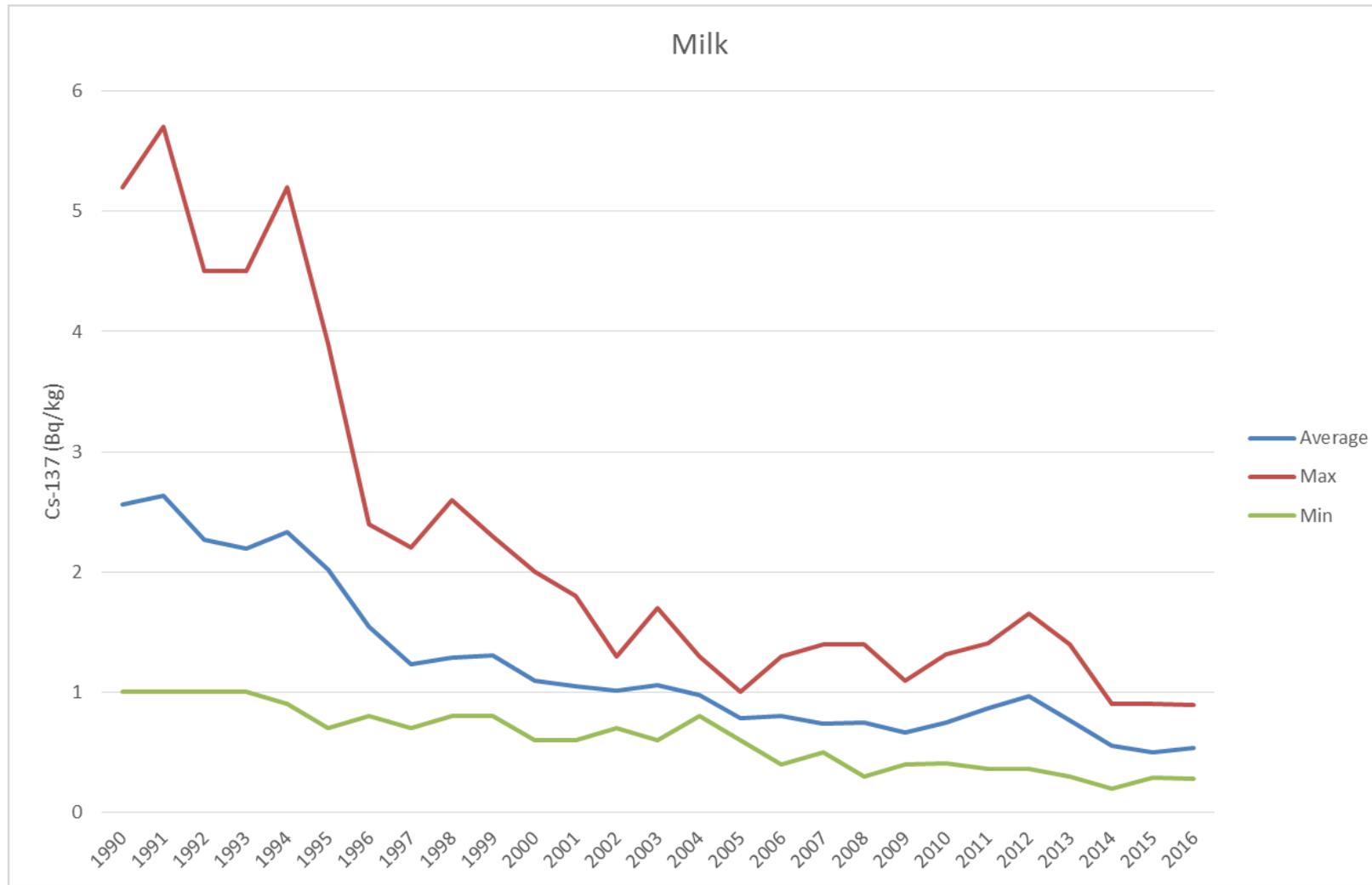


# Sample Series

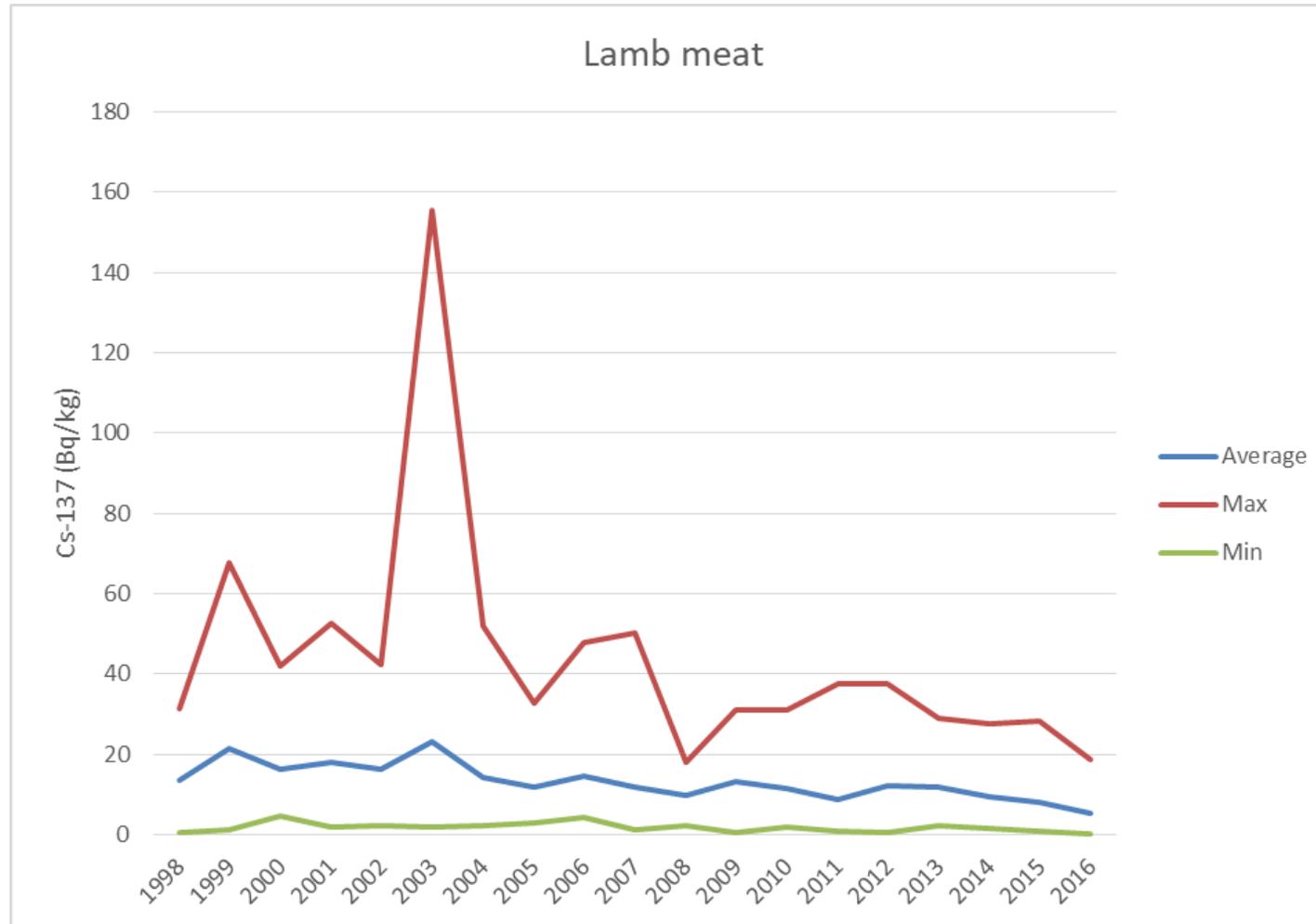
- IRSA founded in 1981
- Regular sampling has been going on since early in IRSA's life
- Some series go back to the 1980's
- Yearly monitoring reports



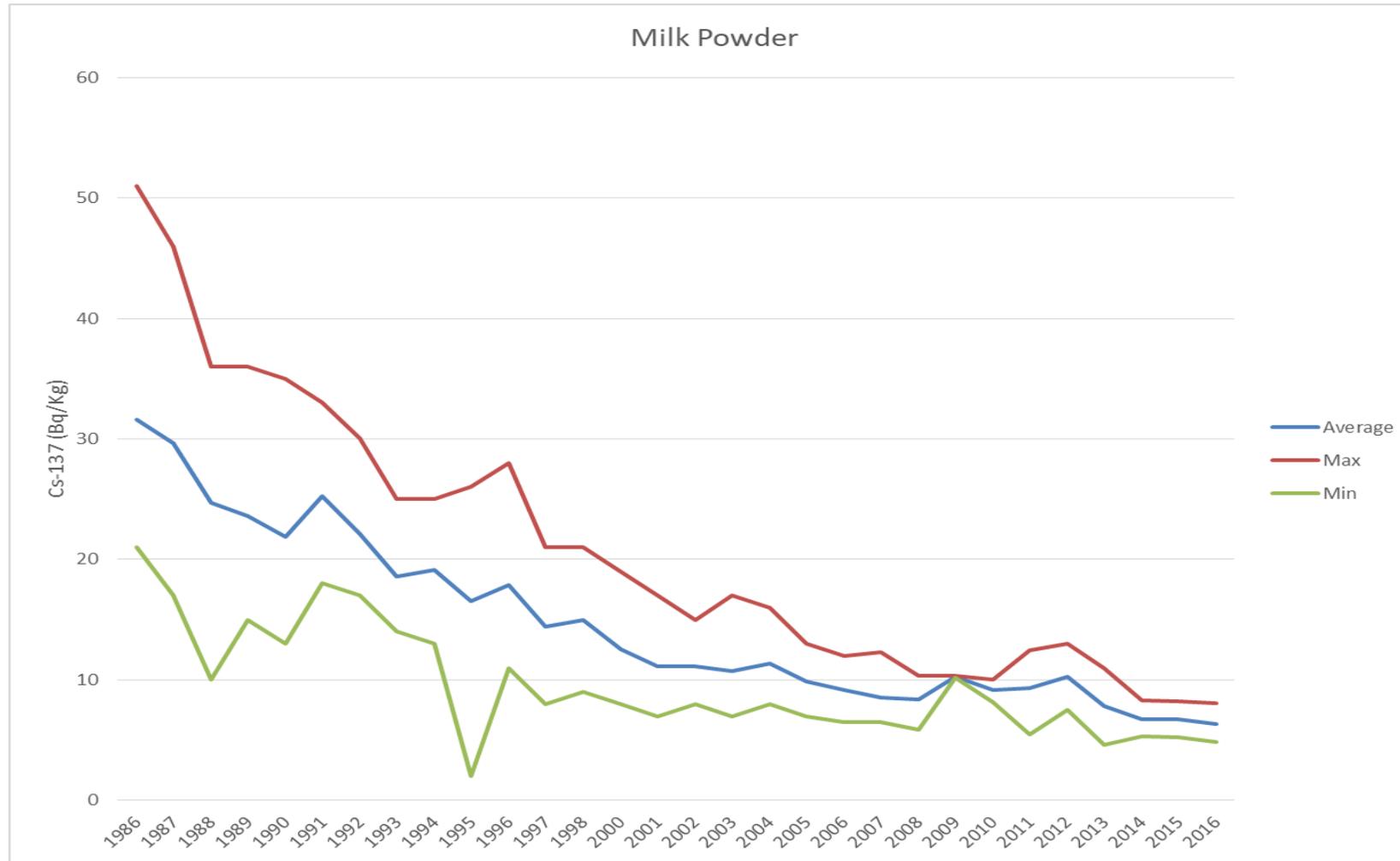
# Milk



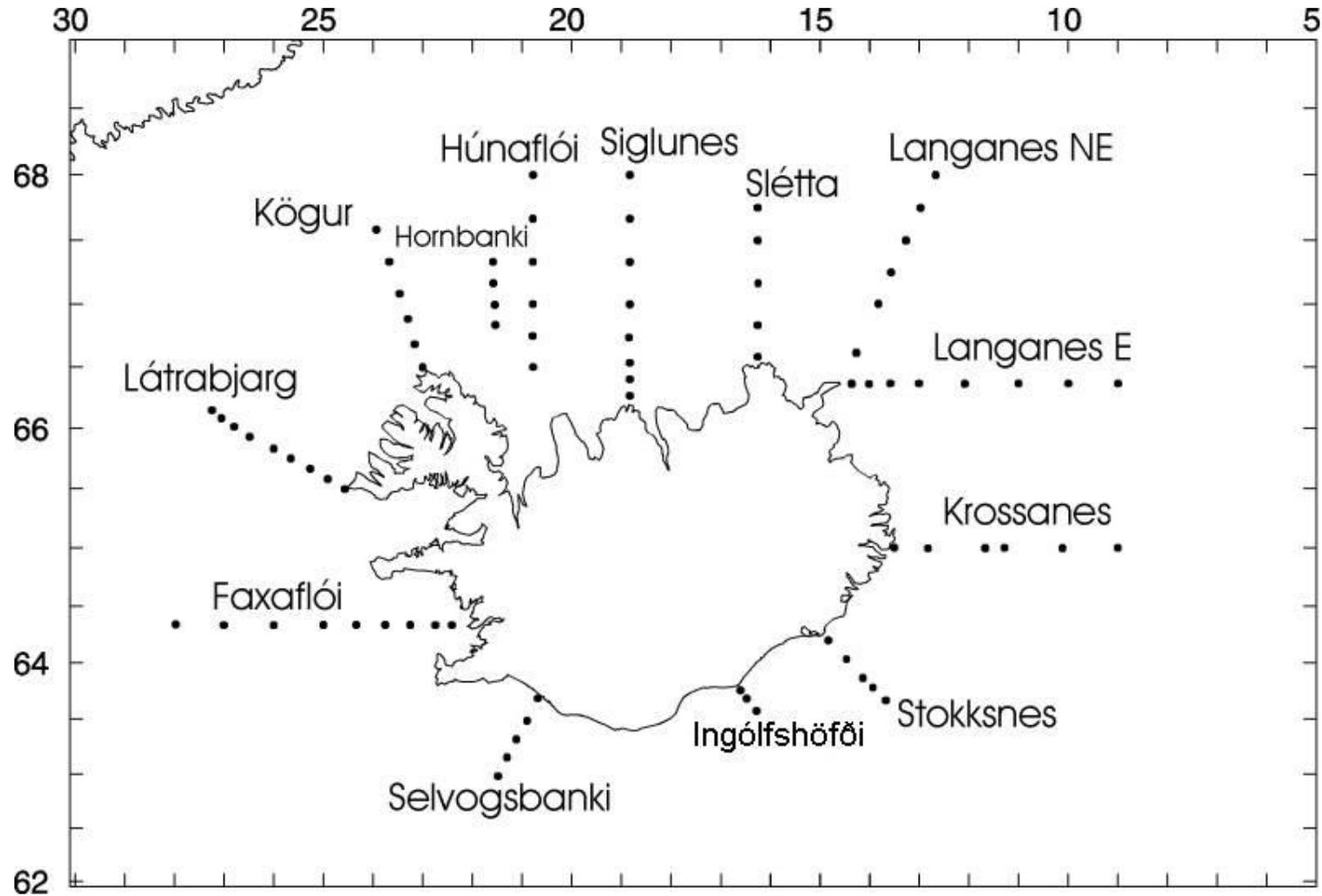
# Lamb



# Milk Powder



# Sea Water Sampling



# Sea Water Samples

- 180 liters per sample
- CuFC (Copper ferrocyanide)
- Cs-134 spike for loss tracking
- Ends up with less than 200 ml of sediment
- Common sample volume: ~70 ml
- Measured and analyzed



## Útreikningur sjávar- og úrkomusýna

### Inntak

SJFX916E

Massi sjávarsýnis sem mælt var

$$m_{\text{sjor\_kg}} = 172,42$$

Fjöldi daga frá viðmiðunardegi til mældidags

$$\Delta_d = 4072$$

Magn CuFe blöndu mælt (rúmmál)

$$vol = 136 \text{ ml}$$

Virgni íbótar í Bq á viðmiðunardegi

$$A_{\text{spike}} = 9,8989 \cdot 126,5905 \quad (\text{sjá neðar})$$

$n = 132302$  Nettófjöldi slaga í viðmiðunartoppi Cs-134 (um 605 keV)

$t = 227916,72$  nettó-talningartími (LT) í sek.

$$c_{\text{cps\_Bq}} = c_3$$

Kvörðunarstuðull m.v. G-2 eða G-3 (velja þarf viðkomandi stuðul að ofan)  
(Velja þarf punkt f. lágskrift)

$$A_{\text{sjor}} = 0,156$$

Mæld virgni (í Bq, ekki Bq/kg) í útfellingu sjávarsýnis

### Reiknaðar stærðir

$$A_{\text{spike\_cps}} = A_{\text{spike}} \cdot c_{\text{cps\_Bq}} \quad \text{Virgni íbótar í cps, m.v. lögun/stærð sýnis}$$

$$A_{\text{spike\_cps\_m}} = A_{\text{spike\_cps}} \cdot 2^{\frac{-\Delta_d}{752,4}} \quad \text{Virgni íbótar í cps á mælidegi}$$

$$\epsilon = \frac{n}{t \cdot A_{\text{spike\_cps\_m}}} \quad \text{Reiknaðar efnafræðiheimtur útfellingar} \quad \epsilon = 0,9942$$

$$A_{\text{sjor\_tonn\_leidrett}} = \frac{A_{\text{sjor}}}{m_{\text{sjor\_kg}} \cdot \epsilon} \cdot 1000 \quad \text{Reiknuð virgni í sjó (úrkomu) Bq/tonn = Bq/m³}$$

$$A_{\text{sjor\_tonn\_leidrett}} = 0,91$$

Bq/tonn

$$\begin{aligned} \text{cal}_{\text{vol3}} &= \begin{bmatrix} 32,7 \\ 87,1 \\ 142 \\ 199 \end{bmatrix} & \text{cal}_{\text{eff3}} &= \begin{bmatrix} 0,030481 \\ 0,02395 \\ 0,019411 \\ 0,016107 \end{bmatrix} \end{aligned}$$

$$\begin{aligned} \text{cal}_{\text{vol2}} &= \begin{bmatrix} 35,6 \\ 92 \\ 147 \\ 202 \end{bmatrix} & \text{cal}_{\text{eff2}} &= \begin{bmatrix} 0,032253 \\ 0,025241 \\ 0,020375 \\ 0,017082 \end{bmatrix} \end{aligned}$$

### Kvörðun á Cs-134 heimtum

$$c_3 = \text{ainterp}(\text{cal}_{\text{vol3}}; \text{cal}_{\text{eff3}}; \text{vol})$$

$$c_2 = \text{ainterp}(\text{cal}_{\text{vol2}}; \text{cal}_{\text{eff2}}; \text{vol})$$



# Norm in Iceland

- Norm (Naturally Occurring Radioactive Material)
- Low natural background
- Almost no natural radioactive materials
- Only been found in geothermal power stations
- Pb-210
  - 10-80 Bq/g
- Po-210
  - 40-420 Bq/g
- No radium

